

Depth estimation of the magnetic basal sources associated with the Curie Isotherm, from aeromagnetic data in Baja California Sur (Mexico) using spectral and geostatistical analysis.

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Nowadays techniques and technologies used in geophysical exploration focused on finding additional natural resources besides those of fossil origin, has new improvements based on theories applied so far only in researching field, such as spectral, and geostatistical analysis in order to estimate the origin of basal magnetic sources known as the depth of Curie's isotherm; very important issue on geothermal deposits.

Fourier analysis applied to potential fields allows the depth estimation of interfaces into the Earth's crust with high contrasts of magnetic susceptibility or density. This method, applied to the magnetic field, uses the relationship among the magnetic anomalies' power spectrum, depth and size of such sources. (Spector and Grant, 1970; Bhattacharyya and Leu, 1975; Blakely, 1995 and Ruiz and Introcaso, 2004). From spectral and geostatistical analysis proposed by Okubo and Bhattacharyya (1985; 1970) it is possible to estimate the depth of basal magnetic source associated with of Curie's isotherm depth whose temperature ranges between of 580 and 600 °C. (Blakely, 1988, 1995; Tanaka et Al., 1999 and Frost and Shive, 1986).

This study is based on the aeromagnetic data acquired by the Mexican Geological Survey and processed to estimate the depths of the magnetic sources in the Tres Virgenes area, Baja California Sur, Mexico. The area of interest was divided in seven windows with squares of 64 Kilometers; knowing that the maximum depth that can be estimated depends on the length of the 2π window. Main magnetic field was included in each window.

In order to estimate depths, the Spector and Grant (1970) methodology was applied; such process assumes that a set of vertical prisms are the sources of the anomalies on the aeromagnetic charts. These prisms define a distribution of magnetic sources, computing its radial power spectra, obtaining its square root, and its natural logarithm it is possible to associate its second slope of the resulting function with the magnetic structure's top depth defined as Z_t .

On the other hand, the geostatistical analysis was done following the methodology published by Bhattacharyya, Leu (1975, 1977) and Okubo (1985) where the radial power spectrum rise to the square root and divided by the absolute value of the wave number. After that the natural logarithm was obtained in order to find the centroid depth (Z_0) of the magnetic structure. The basal depth of the magnetic structures defined as Z_b was calculated by the ratio ($2Z_0 - Z_t$).

The average depth in the area of interest in Tres Virgenes; ranges between 5 to 6 kilometers. It is possible to correlate such results with heat flow values and estimate the current potential of the Tres Virgenes geothermal field and its surroundings.

Keywords: Curie's isotherm, Tres Virgenes, radial power spectrum